Release of *Peristenus stygicus* (Hymenoptera: Braconidae) On the Tarnished Plant Bug, *Lygus lineolaris* (Hemiptera: Miridae) 2002 Annual Report

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Introduction

Tarnished plant bug, (TPB*), Lygus lineolaris*, (Hemiptera: Miridae) is a piercing sucking insect native to North America that feeds on over 300 plant species and causes at least two billion dollars in losses and control costs each year (Day 2002). The adults of TPB over-winter under leaf litter and become active during the first warm days of spring. Mating occurs soon after activity begins and the mated female starts to lay eggs, which hatch within 10 days. During the female TPB's life span she can lay 30 to 120 eggs. The life cycle of the TPB is completed in 3 to 4 weeks. Generally there are 3 to 5 generations per year; in New Jersey there are 3 (Chianese 2001).

The TPB is widely distributed, and it can be found in all states east of the Rocky Mountains and is a pest of many agricultural crops including vegetables, fruits and seed crops (Schwartz and Footit 1998). Damage to these crops frequently goes unrecognized because there are no visible signs of insect feeding to attract attention. The damage that occurs is not obvious until weeks after the feeding was done (Day, 2002). The result of this is a reduced yield due to a severe distortion of fruit or plant terminals. This results in the farmer either putting down a preventative treatment on high value crops, using a broad-spectrum insecticide or risking substantial loss of the product. The preventative spray can also cause other pest problems by killing off the beneficial insect population that keeps minor agricultural pests at tolerable levels.

In the early spring the majority of TPB damage is to tree fruit because of winter annual weeds in bloom. The TPB feed on these weeds and as the weeds die off they move up onto the developing buds (Internet 1991.2). TPB lays its eggs on the flower buds, blossoms and young fruit. Damaged flower clusters appear dried and the leaves distorted but the damage to the fruit is the most important because it can cause punctures or deep dimples to form as the fruit develops causing deformities known as “cat facing” to occur (Internet 1991.1). In New Jersey “ cat facing” insects are the single largest cause for insect fruit damage in peaches statewide and over most varieties” according to Rutgers Cooperative Extension Fruit IPM coordinator Dean Polk (Chianese 2001).

TPB has a number of natural enemies such as other true bugs (nabids, geocorids) ladybird beetles, spiders and parasitic wasps, but they are not able to control the pest effectively (Internet 1991.1). As a result the USDA introduced two species of European parasitoids, *Peristemus digoneutis* and *Peristemus stygicus* (Hymenoptera: Braconidae). These species, which are multivoltine, have been found to parasitize significant numbers of TPB nymphs in certain forage crops and strawberries. *P. digoneutis* has been shown to reduce “cat facing” damage to apples in New Hampshire by 63% (Day 2002).

P. digoneutis is native to Northern Europe and was released in New Jersey in the early 80’s. It has become well established in Northwestern New Jersey, and had not been recovered south of Hunterdon county NJ as of 2001. It was believed that the Southern Jersey climate was not conducive to *P. digoneutis’s* survival. This resulted in the introduction of a second species *P. stygicus,* which is a close relative of *P. digoneutis.* It was imported from southern France where the climate is similar to the temperatures

found in Central and Southern NJ where most of the high cash crops such as peaches, apples and strawberries are grown. Although *P. stygicus* had been released in NJ in the past, it has not established. This could be due to the fact that the releases were minimal, most were less than 100 adults, and all were made in northern NJ where the temperatures are cooler (Chianese 2001).

Materials and Methods

In the fall of 2000, field staff from The Phillip Alampi Beneficial Insect Laboratory (PABIL), using standard insect sweep nets surveyed alfalfa, hay and fallow fields to locate populations of TPB. The data collected during the sweep surveys resulted in a list of possible locations for trial releases. It also provided an available source of TPB for backup in the event the PABIL colony of TPB went into diapause. Additional data collected from the surveys were used to establish baseline information for TPB populations and the level of native parasitoids.

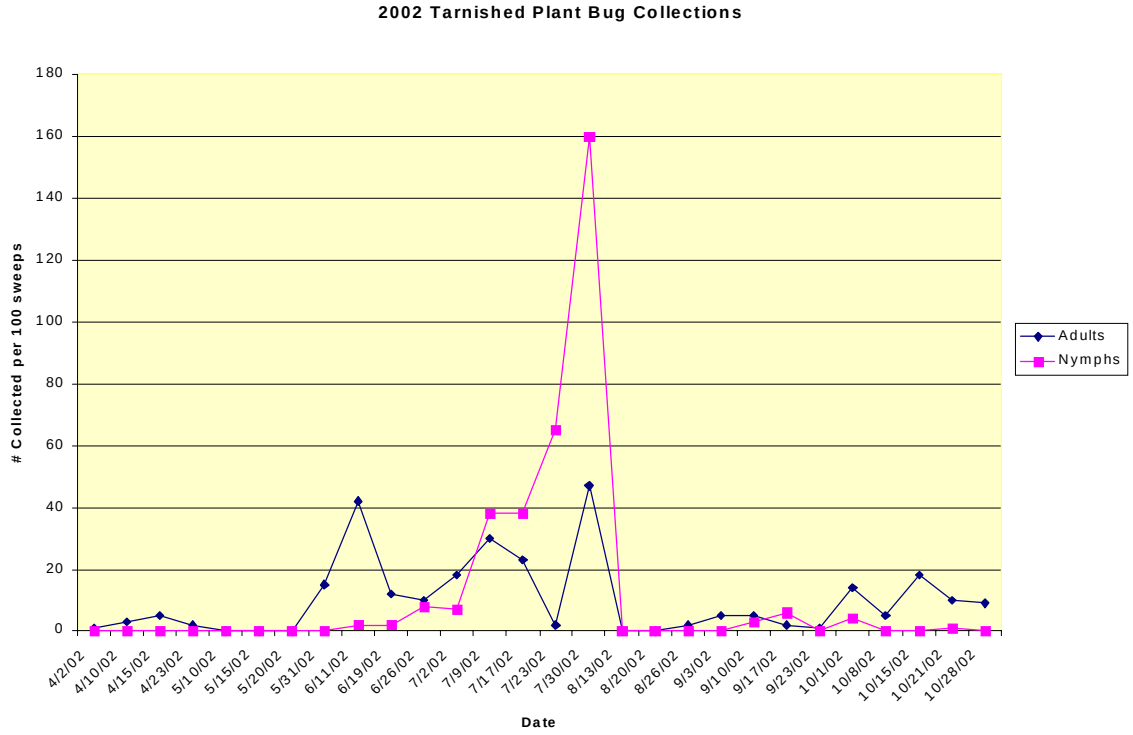
The release site for P. *stygicus* was in an alfalfa field near Aura in Gloucester County. The location of this site was in an area that is surrounded and in close proximity to both apples and peach orchards, which are host crops for the TPB and sustain damage. Alfalfa was chosen because it is a perennial plant and is not cultivated yearly. This practice preserves the field along with its TPB and parasite population. Another determining factor is that TPB only causes minor damage in alfalfa. It is also, seldom treated with insecticides and since we don't know if *P. stygicus* will establish, it is more practical to study the insect in a crop that will experience less economic damage. The intent of this project is to establish *P. stygicus* and once established, reduce the TPB populations within the area thus reducing the reservoir of TPB that would migrate to the high value crops once the alfalfa was cut (Chianese 2001). The grower's agricultural practices also made this study site a good location because cuttings were harvested in strips that were staggered at different times of the year. This practice was beneficial because it confines the TPB to a defined area thus providing a continuous supply of TPB nymphs for *P. stygicus* to parasitize; the field becomes a nurse plot for *P. stygicus*. When *P. stygicus* was first released the strip was not harvested for two months. This enabled the parasitoid to build up its numbers within the release area, before it dispersed into the surrounding strips.

The uncut strips in the release field were sampled weekly using standard insect sweep nets. Samples consisted of 100 sweeps. The collection was then placed into a sleeve cage and the number of adult and nymph TPB was recorded. All nymphs were collected and sampling continued until a total of 75-100 nymphs were accumulated. The nymphs were then taken to PABIL, where they were placed in rearing cages for parasite recovery. Estimating parasitism by rearing TPB nymphs is not accurate because many parasitized TPB nymphs are stressed and die before the parasites emerge. The most accurate method is dissection of the nymphs and performing DNA tests on parasitoid larvae to identify the species. However this is a very time consuming and expensive process (Day 2002). For

this reason, rearing was the logical choice and the bigger sample helped minimize the impact on mortality.

Results and Discussion

Surveys started in April and continued through October. The results from the 28 weeks of survey are shown in Figure 1.



There were a total of 334 nymphs collected. The nymphs first appeared in May with their peak population occurring in late July. The population then declined dramatically to the point of collapse due to the extended drought conditions in NJ in 2002. The nymph population reappeared in September but at much lower levels.

There were a total of 11 releases of *P. stygicus* totaling 1,650 during this time. The releases started in June and continued for seven weeks until nymph populations collapsed; then the releases restarted in September for four more weeks. Eight weekly collections of TPB nymphs were sent to PABIL between 7/2/02 and 10/2/02 for recovery of parasites. A total of 11 Braconids were recovered; six were the native species *Leiophron uniformis*, five were the *Peristenus* species, four of which were *P. digoneutis* and one *P. stygicus.* This recovery was the furthest south in the United States that *P. digoneutis* had been recovered and represents a new county record for New Jersey.

Conclusion

In 2002 the first time recovery of *P. digoneutis* in South Jersey was a program highlight. Previously, it was believed that the Southern Jersey climate was not conducive to *P. digoneutis's* survival.

PABIL's production of P. *stygicus* this year was almost four fold from the previous year, allowing *P. stygicus* to be released more often and in greater quantity then the previous season. This increased production should allow *P. stygicus* the greater opportunity to establish itself. The field staff was also able to establish baseline data for the entire growing season. This information will be used along with the data collected in 2001 to better estimate optimum collection and release times.

In 2003 the goal is to expand the program and set up a new release site. The same criteria will be used in 2003 along with allowing a ½ mile radius buffer around the 2002 site to eliminate the possibility of 2003 *P. stygicus* releases dispersing to the 2002 release site. The 2002 release site will be surveyed for *P. stygicus* establishment.

References

Chianese, R. 2001 Project Proposal Mass Production and release of the Mirid Parasitoid, *Peristenus stygicus* (Hymenoptera: Braconidae)

Day, W 2002 An Evaluation Of Biological Control As A Method Of Reducing Damage To Strawberries By The Tarnish Plant Bug

Internet, 2001.1. http://www.nysae.cornell.edu/ipmet/ny/friuts/FruitFS/tarnishplantbug.html

Internet, 2001.2. http://www.tfpg.cas.psu.edu/part2/part23al.htm

Schwartz, M.D. and R.G. Footit. 1998. Revision of the nearctic species of the genus *Lygus* Hahn, with a review of the palearctic species. Memoirs Entomol. Internat. 10:428 pp Associated Publ. Gainesville, Fl.